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(51) INTL.CL.<sup>5</sup> A63B-059/14; B32B-021/10; B32B-021/14; B32B-017/02

(19) (CA) APPLICATION FOR CANADIAN PATENT (12)

(54) Laminated Reinforcement Panel

(72) Evans, John S. - Canada ;  
Burchmore, William A. - Canada ;  
Leitner, Adalbert - Canada ;

(73) Same as inventor

(57) 18 Claims

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Notice: The specification contained herein as filed

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ABSTRACT OF THE DISCLOSURE

An improved fibreglass wood veneer panel for use in the production of fibreglass-wood composite and fibreglass-foam composite sports stick handles. The panel comprises a pair of adjacent layers of wood which are bonded together by a coating of adhesive which is non-permeable to epoxy resin, and a layer of fibreglass and epoxy resin on the outer surface of one of the layers of wood.

BACKGROUND OF THE INVENTION

The present invention relates to laminated panels which may be used, for example to reinforce handles and shafts used in various sports. The present invention has particular application to hockey stick handles.

At present, hockey stick manufacturers often bond reinforcement panels to shaft cores made of a hardwood such as poplar. The cores are conventionally rectangular in transverse cross-section, and are constructed so that the wider surfaces are more or less parallel to the hockey stick blade. The panels are composed solely of epoxy and uni-directional fibreglass and are secured to the wider surfaces of the core to assist in strengthening the hockey stick against forces normal to these surfaces (see e.g. Canadian Patent No. 1,150,331 of Koebel issued July 19, 1983). The reinforcement panels must be sanded on one surface to permit further bonding to the core using epoxy resin. The problems with this are that, firstly, the epoxy resin is expensive and, secondly, the sanding breaks a large percentage of the glass fibres in the panel, causing a corresponding reduction in the strength that the panel was designed to provide.

If a laminate made of wood and epoxy/fibreglass layers is produced, because the epoxy resin permeates the wood layer, it is very difficult to bond the wood layer of such a laminate panel to a wooden core without using an expensive adhesive which is compatible with epoxy resin.

It is an object of the present invention to provide an

improved panel with a wood surface that can be bonded to shaft cores with cheaper wood glues, and at the same time protect the surface of the fibreglass laminate from the destructive effect of sanding.

5           It is a further object of the present invention to provide a laminated fibreglass reinforcement panel having at least one exposed face of veneer with a wood glue compatible surface.

#### SUMMARY OF THE INVENTION

10           In accordance with the present invention there is provided a fibreglass wood veneer laminated panel which comprises a pair of adjacent layers of wood bonded together by a coating of adhesive, the coating being non-permeable to epoxy resin, and a layer of fibreglass and epoxy resin on the outer surface of one of the layers of wood.

15           In an alternative embodiment of the present invention, the fibreglass-wood veneer panel comprises a pair of adjacent layers of wood bonded together by a coating of adhesive which is non-permeable to epoxy resin and are bonded to each surface by a layer of fibreglass and epoxy resin.

20           As well, the invention relates to a shaft for a hockey stick and the like which has a core of rectangular transverse cross-section. Each of the opposite, wider faces of the core has bonded to it a fibreglass wood veneer laminated panel. The panel comprises a pair of adjacent layers of wood bonded together by a  
25           coating of adhesive which is non-permeable to epoxy resin, and a

layer of fibreglass and epoxy resin on the outer surface of one of the layers of wood. The outer surface of the other of the layers of wood is bonded to the corresponding surface of the core by a conventional wood glue.

5           The panel according to the present invention provides a fibreglass and wood veneer reinforced panel for hockey stick handles and the like, which provides excellent reinforcement characteristics while at the same time permitting its bonding with cheaper wood glues.

10

BRIEF DESCRIPTION OF THE DRAWINGS

These and other objects and advantages of the invention will become apparent upon reading the following detailed description and upon referring to the drawings in which:

15           FIGURE 1 is a perspective plan view of a fibreglass wood veneer laminated panel in accordance with the present invention, the layers shown in stepped section at one end;

          FIGURE 2 is a section view of an alternative embodiment of fibreglass wood veneer laminate panel in accordance with the present invention;

20           FIGURE 3 is a perspective, partial view of a hockey stick shaft incorporating a laminated panel in accordance with the present invention; and

          FIGURE 4 is a section view of a further alternative embodiment of laminated panel in accordance with the present  
25   invention.

While the invention will be described in conjunction with example embodiments, it will be understood that it is not intended to limit the invention to such embodiments. On the contrary, it is intended to cover all alternatives, modifications and equivalents as may be included within the spirit and scope of the invention as defined by the appended claims.

#### DETAILED DESCRIPTION OF THE INVENTION

In the drawings, similar features have been given similar reference numerals.

Turning to FIGURE 1 there is shown a fibreglass wood veneer laminated panel 2 in accordance with the present invention. Panel 2 comprises a pair of adjacent layers 4 and 6, of a hardwood such as birch, bonded together by a coating of adhesive 8 which is non-permeable to epoxy resin. The bonding agent which is non-permeable to epoxy resin is preferably urea formaldehyde plus its catalyst. To layer 6 is bonded a layer 10 of uni-directional fibreglass fibres 11 and epoxy resin.

Panel 2 may be manufactured using a standing press capable of maintaining a constant temperature (e.g. 100°C to 135°C) and pressure (e.g. 10 psi to 40 psi). Prior to introduction to the press, the panel components are assembled by a layer of wood veneer 4 (0.020" to 0.040"), a coating of the non-permeable bonding agent 8, wood veneer layer 6 (again 0.020" to 0.040"), and a layer 10 of uni-directional fibreglass and epoxy (0.015" to 0.045").

An optional construction, as set out in FIGURE 2,

includes additional wood veneer layers 12 and 14, similarly bonded by a non-permeable bonding agent 8, bonded to the other side of fibreglass and epoxy layer 10.

5 The fibreglass layer 10 may also contain uni-directional fibres such as graphite, carbon, nylon, Kevlar (trade mark) or any other fibre that might enhance that layer structurally or visually, or it might instead be a layer of similar rigid thermoplastic or thermoset materials.

10 The advantage of the panel in accordance with the present invention is that it circumvents the requirement of sanding and use of epoxy resin or other expensive adhesives for further bonding of the panels to the core. This is achieved by having the two adjacent wood veneer layers bonded by means of the adhesive which is non-permeable to the epoxy resin used in the fibreglass laminate  
15 layer yet which is compatible with it. This allows the finished panel to have a wood veneer face that has not been permeated with epoxy and hence can be bonded to the core by conventional wood glues. The conventional wood glues in question may be aliphatic resins, polyvinyls, urea formaldehyde and catalysts, or glue films  
20 of either melamine or phenolic resins.

In FIGURE 3 there is illustrated a pair of panels 2, similar to that of FIGURE 1, secured to the wider faces of the core 16 of a shaft for a hockey stick or the like. Core 16 is made, for example of a hardwood such as poplar, or a high strength foamed  
25 plastic and has a rectangular transverse cross-section. As can be seen in phantom in FIGURE 3, fibreglass fibres 11 are uni-directional in the direction of the longitudinal axis of core 16.

The panel 2 made in accordance with the invention as illustrated in FIGURE 1 is rectangular in cross-section and has a fibreglass layer having a smooth surface. In the form of FIGURE 2, a smooth wood surface is presented on both sides of the panel. To manufacture shafts from these panels, panels of a particular size are bonded to opposite surfaces of a core of corresponding size and a number of appropriately sized shafts are then cut from the bonded core and panels. This bonding may be achieved using any appropriate conventional wood glue, as mentioned previously herein.

10 This is made possible by the fact that the epoxy resin of the fibreglass layer is allowed to permeate the wood veneer of layer 6 (FIGURES 1 and 2) or 12 (FIGURE 2) but not layer 4 or 14 during the pressing and curing process, through the use of the non-permeable bonding agent 8 between the two adjacent wood veneer layers 4 and 6 (FIGURES 1 and 2) and 12 and 14 (FIGURE 2).

15 The shaft prepared according to the present invention provides excellent stiffness and flexibility in the required direction (normal to the wide surfaces of the core).

20 The panels may be of any desired construction, and, for example as illustrated in FIGURE 4, a non-coextensive layer of fibreglass and epoxy, layer 10, may be made coextensive with the other layers of wood veneers, 4 and 6, by the addition of a wood veneer strip 20 of such dimensions that it completes the continuity of non-coextensive layer 18 and provides a continuous smooth face on the exterior.

25 Where a panel of a construction illustrated in FIGURE 2 is bonded to the wider surfaces of core 16 in a hockey stick shaft



or the like, the exterior wood veneer which is thus provided gives an excellent surface for both appearance and printing (for example the brand name of the hockey stick).

Thus it is apparent that there has been provided in  
5 accordance with the invention a laminated reinforcement panel that fully satisfies the objects, aims and advantages set forth above. While the invention has been described in conjunction with specific embodiments thereof, it is evident that many alternatives, modifications and variations will be apparent to those skilled in  
10 the art in light of the foregoing description. Accordingly, it is intended to embrace all such alternatives, modifications and variations as fall within the spirit and broad scope of the invention.

THE EMBODIMENTS OF THE INVENTION IN WHICH AN EXCLUSIVE  
PROPERTY OR PRIVILEGE IS CLAIMED ARE DEFINED AS FOLLOWS:

1. A fibreglass wood veneer laminated panel for hockey stick handles comprising a pair of adjacent layers of wood bonded together by a coating of adhesive, the coating being non-permeable to epoxy resin, and a layer of fibreglass and epoxy resin on the outer surface of one of the layers of wood, whereby the outer surface of the other of the layers of wood is bondable to a corresponding surface of a core by means of a conventional wood glue.
2. A panel according to claim 1 wherein a pair of adjacent layers of wood bonded together by a coating of adhesive, the coating being non-permeable to epoxy resin, are bonded to each surface of a layer of fibreglass and epoxy resin.
3. A panel according to claim 1 wherein the layer of fibreglass and epoxy resin is non-coextensive and does not completely cover the adjacent layer of wood.
4. A panel according to claim 3 wherein the layer of fibreglass and epoxy resin is made coextensive with the adjacent layer of wood by the addition of a strip of wood veneer having dimensions so as to complete the continuity of said non-coextensive layer and provide a continuous smooth exterior surface with the layer of fibreglass and epoxy resin.

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5. A panel according to claim 1 wherein the wood layers are of hardwood.
6. A panel according to claim 5 wherein the wood layers are of birch.
7. A panel according to claim 1 wherein the fibreglass is uni-directional in the fibreglass and epoxy resin layer.
8. A panel according to claim 6 wherein the fibreglass is uni-directional in the fibreglass and epoxy resin layer.
9. A shaft for use on a hockey stick or the like having a core of rectangular transverse cross-section, each of the opposite, wider faces of the core having bonded to it a fibreglass wood veneer laminated panel comprising a pair of adjacent layers of wood bonded together by a coating of adhesive, the coating being non-permeable to epoxy resin, and a layer of fibreglass and epoxy resin being on the outer surface of one of the layers of wood, the outer surface of the other of the layers of wood being bonded to the corresponding surface of the core by means of a conventional wood glue.
10. A shaft according to claim 9 wherein the wood layers are of hardwood.

11. A shaft according to claim 10 wherein the wood layers are of birch.
12. A shaft according to claim 9 wherein the fibreglass is uni-directional in the longitudinal direction of the shaft.
13. A shaft according to claim 12 wherein the wood layers are of birch.
14. A shaft according to claim 12 wherein the core is of wood.
15. A shaft according to claim 12 wherein the core is of foamed plastic.
16. A shaft according to claim 9 wherein the fibreglass and epoxy resin layer also contains one or more of the following uni-directional fibres: graphite, carbon, nylon, Kevlar (trade mark), such fibres to enhance the layer structural or visually.
17. A shaft for use in a hockey stick or the like having a core of rectangular transverse cross-section, each of the opposite wider faces of the core having bonded to it a plastic-wood veneer laminated panel comprising a pair of adjacent layers of wood bonded together by a coating of adhesive, the coating being non-permeable to epoxy resin, and a layer of plastic selected from the group

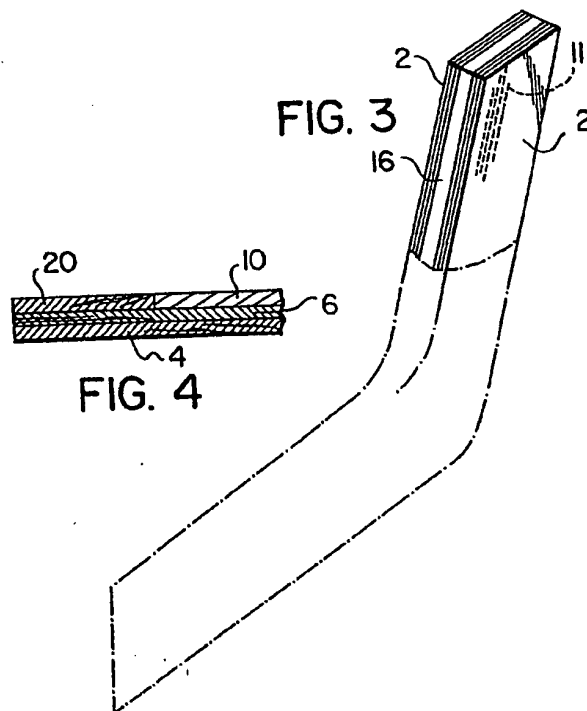
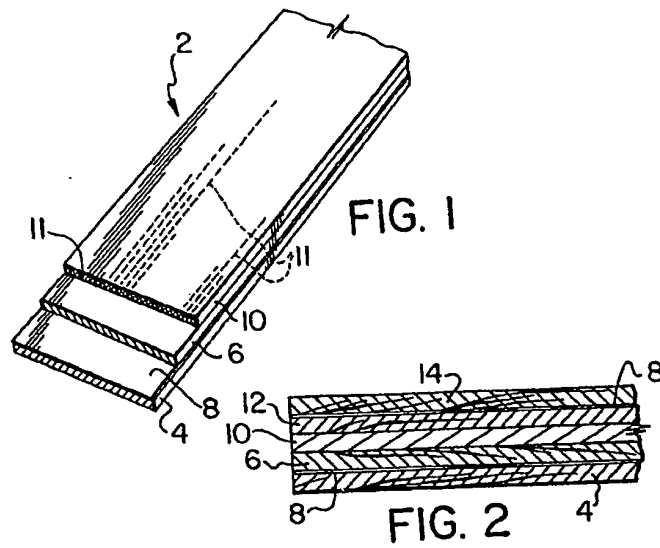
comprising thermoplastics and thermoset plastics, this latter layer being on the outer surface of one of the layers of wood, the outer surface of the other layers of wood being bonded to the corresponding surface of the core by means of a conventional wood glue.

18. A panel according to claim 1 wherein the adhesive coating between the layers of wood is catalysed urea formaldehyde.

Messrs. Burke-Robertson,  
70 Gloucester Street,  
Ottawa, Ontario, Canada,  
K2P 0A2

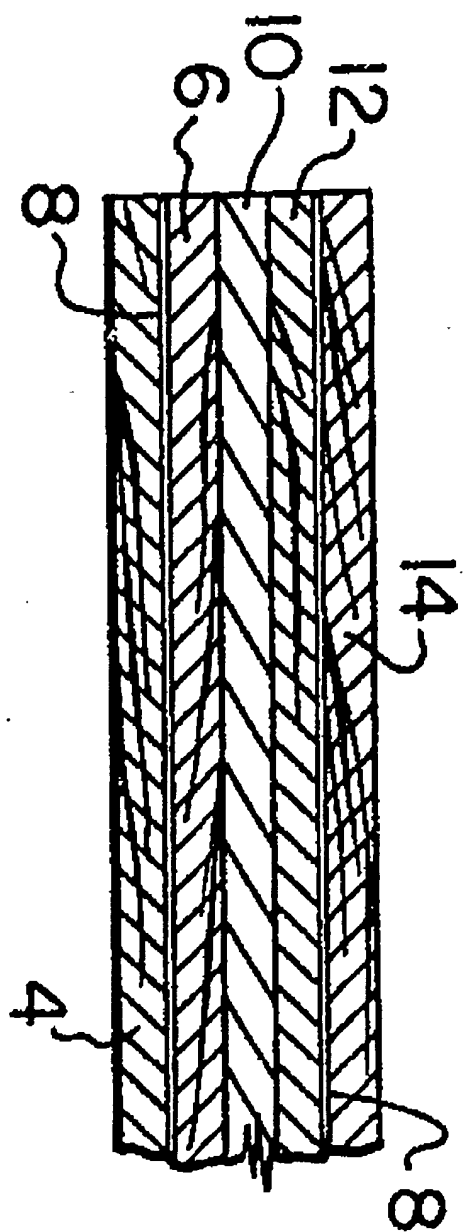
Patent Agents for the Applicant

2029109



Inventors: John S. Evans, et al

Patent Agents: Burke-Robertson



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